REMARKS

Claims 73-78, 80-99, 102 and 103 are pending in this application. By this Amendment, the Abstract and claims 73, 75-78, 80, 83, 84, 87-90, 92, 94-99, 102, and 103 are amended, and claims 1-72, 79, 100 and 101 are cancelled. The Abstract is revised to remove the terminology "said." Reconsideration in view of above-outlined amendments and the following remarks is respectfully requested.

I. THE CLAIMS SATISFY 35 CFR § 1.75(C)

Claims 8, 41, 45, 72, 78, 79, 94-101 and 103 were objected to under 37 CFR § 1.75(c) as being in improper multiple dependent form. Applicants respectfully submit that the cancellation of claims 8, 41, 45, 79, 100 and 101 and the above-outlined amendments to the claims fully obviate the grounds for the objection. Reconsideration and withdrawal of the objection are respectfully requested.

II. THE CLAIMS SATISFY 35 USC § 112, SECOND PARAGRAPH

Claims 1-71, 73-77, 80-93 and 102 were rejected to under 35 USC § 112, second paragraph as being indefinite. This rejection is respectfully traversed. Applicant submits that the cancellation of claims 1-71 and the above-outlined amendments to the claims fully obviates the grounds for the rejection. Reconsideration and withdrawal of the rejection are respectfully requested.

III. THE CLAIMS DEFINE PATENTABLE SUBJECT MATTER

Claims 1-4 and 6 were rejected under 35 USC § 102(b) or 35 USC § 103(a) over US Patent No. 3,956,186 to Iwase et al. ("Iwase"). Claims 1-12, 15-23, 32-38 and 55 were rejected under 35 USC § 102(b) or 35 USC § 103(a) over WO97/32817 to Sato ("Sato '817") or US Patent No. 6,171,573 to Sato ("Sato '573"). Claims 1-4, 6, 24-31, 39-55, 57, 70-71 and 73-79 were rejected under 35 USC § 102(b) or 35 USC § 103(a) over US Patent No. 5,607,885 to Ichii et al. ("Ichii"). Claim 13 and 14 were rejected under 35 USC § 103(a) over Sato '573 in view of US Patent No. 4,956,329 to Chao et al. ("Chao"). Claims 5, 56, 58-69, 80-93 and 102 were rejected under 35 USC § 103(a) over Ichii in view of US Patent No. 5,346, 722 to Beauseigneur et al. ("Beauseigneur").

Claims 1-71, 79, 100 and 101 have been cancelled. As such, the following remarks shall only address the outstanding rejections for those claims that are pending.

A. Claims 73-78 and 94-99 Are Patentable Over Ichii

Claims 73-78 were rejected under 35 USC § 102(b) or 35 USC § 103(a) over Ichii. This rejection is respectfully traversed.

The Office Action alleges that Ichii "discloses cordierite honeycomb (see column 3, lines 43-47) with a lattice defect with oxygen vacanies and oxygen storing capability (see column 1, lines 63-66; the term "capability" indicating oxygen may or may not be stored), a composition of more than 48% by weight (see column 5, lines 29-30), and a honeycomb catalyst carrier without a coating (see column 1, lines 17-19), heating to form microcracks, and reheating (see column 4, lines 60-67).with a lattive defect with oxygen vacancies and oxygen storing capability (see column 4, lines 60-67)." Applicants respectfully disagree with this characterization of Ichii. The description of the invention of Ichii and the description of the prior art distinguished by Ichii have been combined to allegedly teach the present invention.

Independent claim 73 is directed to a catalyst-ceramic body having a catalyst component directly supported on a ceramic support. There is no coating layer on a surface of the ceramic support.

The Office Action asserts that Ichii discloses "a honeycomb catalyst carrier without a coating (see column 1, lines 17-19)." Applicants respectfully submit that this assertion is in error. Ichii discloses that the honeycomb catalyst carrier is used for cleaning an exhaust gas for an automobile. There is no disclosure of a lack of a coating on a ceramic support. To the contrary, applicants submit that it is inherent to use a coating on a support for a catalyst for the purpose stated on column 1, lines 17-19 in Ichii. In support, Applicants submit copies of two SAE technical papers entitled "Thin Walled Ceramic Catalyst Supports" and "Thermal Shock Resistance of Standard Thin Wall Ceramic Catalysts."

Accordingly, applicants respectfully submit that Ichii fails to disclose, teach or suggest the subject matter of independent claim 73. Claims 74-78 and 94-99 depend either directly or indirectly from claim 73. Applicants respectfully submit that Ichii fails

to disclose, teach or suggest the subject matter of these claims for at least these same reasons.

Claim 74 depends from claim 73 and further specifies that the average distance between particles of the catalyst component on the surface of the ceramic support is in the range of 0.1 to 1000nm. Ichii discloses mean crystal diameters of the cordierite crystals in the aggregate. There, however, is no disclosure of the average distance between the particles of the catalyst component on the surface of the ceramic support. Furthermore, there is no disclosure of the range specified in claim 74.

Claim 75 depends from claim 74 and further specifies that the average distance between particles of the crystal component is in a range of 0.1 to 100nm. As identified above, Ichii discloses mean crystal diameters of the cordierite crystals. There, however, is no disclosure of the average distance between the particles of the crystal component. Furthermore, there is no disclosure of the range specified in claim 75.

Claim 78 depends from claim 73 and further specifies that the ceramic support has a multiple number of fine pores with a diameter or width of 0.1 to 100nm on the surface of the ceramic support. Ichii does not disclose the claimed fine pores. Instead, Ichii discloses the presence of microcracks (see column 4, lines 35-59), which form as a result of thermal shrinkage during cooling when the cordierite crystals are bonded along their interface. The pores disclosed in the present invention are finer than the microcracks in in Ichii, which permit the catalyst to be directly supported on the surface of the ceramic body. Ichii does not disclose this. Furthermore, Ichii does not disclose the claimed pore size.

Applicants respectfully submit that Ichii fails to disclose, teach or suggest the subject matter of claims 73-78 and 94-99. Reconsideration and withdrawal of the rejection based upon Ichii are respectfully requested.

B. Claims 80-93, 102 and 103 are patentable over Ichii in view of Beauseigneur

Claims 80-93 and 102 were rejected under 35 USC § 103(a) over Ichii in view of Beauseigneur. This rejection is respectfully traversed.

Independent claim 80 is directed to a catalyst-ceramic body having a ceramic support comprising a honeycomb structure having at least as a main component a cordierite composition. At least one of Si, Al and Mg elements constituting the cordierite composition being replaced by a metal having a catalyst activity.

The Office Action correctly identifies that Ichii fails to disclose the substitution of a metal having catalyst activity. The Office Action relies on Beauseigneur for allegedly teaching the deficiencies in Ichii.

Beauseigneur is directed to the prevention of mircocracks on the surface of the sintered body from being buried by γ – alumina. Typically when a sintered body is coated by γ – alumina, microcracks on the surface of the sintered body are buried and the thermal expansion coefficient of the obtained sintered body becomes large. Beauseigneur discloses the use of a resin that is preliminarily buried in microcracks on the surface of the sintered body before coating γ – alumina. During the firing of the alumina, the resin is burned to form microcracks, which obtains a ceramic body having a small thermal expansion coefficient. Beauseigneur does disclose the use of noble metals but only as the catalyst metal to be supported on the γ – alumina coating.

By contrast, a portion of the crystal constituting a ceramic body of the present invention is replaced by a noble metal having a catalyst activity. Beauseigneur does not disclose, teach or suggest the claimed replacement. As such, the combination of Ichii and Beauseigneur does not render obvious the subject matter of claim 80. Accordingly, one of ordinary skill in the art would not be motivated to modify Ichii in the manner suggested in the Office Action. Claims 81-86 and 102 depend from independent claim 80. Applicants respectfully submit the combination of Ichii and Beauseigneur fails to render obvious the subject matter of these claims for at least the same reasons.

Claim 84 depends from claim 80 and further specifies that the honeycomb structure has at least one of oxygen vacancies and lattice defects in the cordierite crystal lattice, on which a catalyst component is supported. Both Ichii and Beauseigneur fail to disclose this feature. The only vacancies and defects disclosed in Ichii are located in the glass particles of the starting material not the cordierite crystal lattice. Beauseigneur contains no disclosure of vacancies and defects.

Independent claims 87 and 88 are directed to processes for producing a catalyst-ceramic body. The claimed process includes preparing cordierite materials comprising an Si source, an Al source and a Mg source as well as a binder. Some of the Si, Al and Mg sources are replaced by a noble metal-containing compound (claim 87) or a noble metal-containing compound and a Ce-containing compound (claim 88). The cordierite materials are formed into a honeycomb shape. The honeycomb shape is heated to remove the binder. The honeycomb shape is then fired in a reduced pressure atmosphere, an oxygen-containing atmosphere or an oxygen-free atmosphere to form a catalyst-ceramic body. The catalyst-ceramic body includes a ceramic support of a honeycomb structure containing a cordierite material as a main component.

As discussed above in connection with claim 80, Beauseigneur only discloses the use of noble metals as the catalyst metal to be supported on a γ – alumina coating. There is no disclosure of replacing a portion of the crystal constituting a ceramic body with a noble metal having a catalyst activity in accordance with the present invention. Beauseigneur does not disclose, teach or suggest the claimed replacement. As such, the combination of Ichii and Beauseigneur does not render obvious the subject matter of claims 87 or 88. Accordingly, one of ordinary skill in the art would not be motivated to modify Ichii in the manner suggested in the Office Action. Claims 89-93 and 103 depend from independent claim 87. Applicants respectfully submit the combination of Ichii and Beauseigneur fails to render obvious the subject matter of these claims for at least the same reasons.

With regard to claims 92 and 93, Ichii and Beauseigneur fail to disclose the claimed shock wave.

Applicants respectfully submit that the combination of Ichii and Beauseigneur fails to disclose, teach or suggest the subject matter of claims 80-93, 102 and 103. Reconsideration and withdrawal of the rejection are respectfully requested.

IV. CONCLUSION

Applicant respectfully submits that the claims define subject matter that is patentable over the prior art cited of record. It is respectfully submitted that the application is in condition for allowance. Should further issues require resolution prior to allowance, the Examiner is requested to telephone applicants' undersigned attorney at the number below.

Respectfully submitted,

PILLSBURY WINTHROP LLP

By: _____

Glenn T. Barrett, Reg. No.: 38,705
Tel. No.: (703) 905-2011
Fax No.: (703) 905-2500
gbarrett@pillsburywinthrop.com

GTB/jck

Attachments:
Appendix (pp. 11-15)
Abstract (p. 16)
Thin Wall Ceramic Catalyst Supports
Thermal Shock Resistance of Standard and Thin Wall Ceramic Catalysts

1600 Tysons Boulevard
McLean, VA 22102
(703) 905-2000

APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE ABSTRACT:

The Abstract is amended as follows:

A ceramic support capable of supporting a catalyst comprising a ceramic body having fine pores with a diameter or width up to 1000 times the ion diameter of a catalyst component to be supported on the surface of the [said] ceramic body, the number of the [said] fine pores being not less than 1 $x10^{11}$ pores per liter, is produced by introducing oxygen vacanies or lattice defects in the cordierite crystal lattice or by applying a thermal shock to form fine cracks.

IN THE CLAIMS:

Claims 73, 75-78, 80, 83, 84, 87-90, 92, 94-97, 102, and 103 are changed as follows:

73. (Amended) A catalyst-ceramic body comprising a catalyst component directly supported on a ceramic support without a coating layer on a [the] surface of the ceramic support [thereof].

75. (Amended) The catalyst-ceramic body according to claim 73 [or 74], wherein said average distance between particles of said crystal component is in a range of 0.1 to 100nm.

76. (Amended) The catalyst-ceramic body according to claim 73, wherein said catalyst component includes at least one component selected from the group consisting of [at least one of] metals having a catalyst activity and metal oxides having a catalyst activity.

77. (Amended) The catalyst-ceramic body according to claim 76, wherein said metals having a catalyst activity are noble metals and said metal oxides having a catalyst activity are oxides containing at least one metal selected from the group consisting of V, Nb, Ta, Cr, Mo, W, Mn, Fe, Co, Ni, Cu, Zn, Ga, Sn, and Pb.

78. (Amended) The catalyst-ceramic body according to claim 73 [72], wherein said ceramic support has a multiple number of fine pores with a diameter or width of 0.1 to 100nm on the surface of the ceramic support [thereof].

80. (Amended) A catalyst-ceramic body comprising a ceramic support comprising a honeycomb structure comprising at least as a main component [mainly comprised of] a cordierite composition, wherein [some of] at least one of Si, Al and Mg elements constituting the cordierite composition being replaced by a metal having a catalyst activity.

83. (Amended) The catalyst-ceramic body according to claim 80, wherein said metal having a catalyst activity includes at least one material from the group consisting [is at least one] of noble metals, V, Nb, Ta, Cr, Mo, W, Mn, Fe, Co, Ni, Cu, Zn, Ga, Sn, and Pb.

84. (Amended) The catalyst-ceramic body according to claim 80, wherein said honeycomb structure has at least one [ones] of oxygen vacancies and lattice defects in the cordierite crystal lattice, on which a catalyst component is supported.

87. (Amended) A process for producing a catalyst-ceramic body, comprising [the steps of]:

preparing cordierite materials comprising an Si source, an Al source and a Mg source as well as a binder, some of said Si, Al and Mg sources being replaced by a noble metal-containing compound,

forming said cordierite materials into a honeycomb shape,

heating said honeycomb shape to remove said binder, and

firing said honeycomb shape in a reduced pressure atmosphere at a pressure of not higher than 4000 Pa, a reducing atmosphere, an oxygen-containing atmosphere or an oxygen-free atmosphere to form a catalyst-ceramic body comprising a ceramic support of a honeycomb structure comprising at least as a main component [mainly comprised] of a cordierite composition.

88. (Amended) A process for producing a catalyst-ceramic body, comprising [the steps of]:

preparing cordierite materials comprising an Si source, an Al source and a Mg source as well as a binder, some of said Si, Al and Mg sources being replaced by a noble metal-containing compound and a Ce-containing compound,

forming said cordierite materials into a honeycomb shape,

heating said honeycomb shape to remove said binder, and

firing said honeycomb shape in a reduced pressure atmosphere at a pressure of not higher than 4000 Pa, a reducing atmosphere, an oxygen-containing atmosphere or an oxygen-free atmosphere to form a catalyst-ceramic body comprising a ceramic support of a honeycomb structure comprising at least as a main component [mainly comprised] of a cordierite composition.

89. (Amended) The process according to claim 87, wherein said [obtained] fired honeycomb structure is further heated to a predetermined temperature and then rapidly cooled from said predetermined temperature.

90. (Amended) The process according to claim 87, wherein said [obtained] fired honeycomb structure is further rapidly cooled to [from] a predetermined temperature during cooling from a firing temperature [used in said firing].

92. (Amended) The process according to claim 87, wherein said [obtained] fired honeycomb structure is further subjected to a shock wave.

94. (Amended) A process for producing the catalyst-ceramic body as set forth in claim 73[72], comprising depositing at least one of a catalyst component and[/or] a precursor of a catalyst component on said ceramic support by one of a CVD and [or] PVD method.

95. (Amended) A process for producing the catalyst-ceramic body as set forth in claim 73[72], comprising depositing at least one of a catalyst component and[/or] a precursor of a catalyst component on said ceramic support by means of a super critical fluid.

96. (Amended) A process for producing the catalyst-ceramic body as set forth in claim 73[72], comprising depositing at least one of a catalyst component and[/or] a precursor of a catalyst component on said ceramic support by means of a solvent having a surface tension smaller than water.

97. (Amended) A process for producing the catalyst-ceramic body as set forth in claim 73[72], comprising depositing at least one of a catalyst component and[/or] a precursor of a catalyst component on said ceramic support by means of a solvent having a surface tension smaller than water while applying one of vibration and [or] performing vacuum defoaming.

98. (Amended) A process for producing the catalyst-ceramic body as set forth in claim 73[72], comprising depositing a precursor of a catalyst component on said ceramic support followed by a heat treatment.

99. (Amended) A process for producing the catalyst-ceramic body as set forth in claim 73[72], comprising depositing a catalyst component a plurality of times using the same or different compositions.

102. (Amended) The catalyst-ceramic body according to claim 80 [any one of claims 80 to 86], wherein said cordierite has a composition corresponding to a theoretical composition expressed by $2MgO \bullet 2Al_2O_3 \bullet 5SiO_3$.

103. (Amended) The process for producing a catalyst-ceramic body according to claim 89 [any one of claims 89 to 99], wherein said cordierite has a composition corresponding to a theoretical composition expressed by $2MgO \bullet 2Al_2O_3 \bullet 5SiO_3$.

End of Appendix.